



Vaclon Plus 300 pumps

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919-0716/0736/0746/0876
919-0717/0737/0747/0877**

MANUALE DI ISTRUZIONI

BEDIENUNGSHANDBUCH

NOTICE DE MODE D'EMPLOI

INSTRUCTION MANUAL

ISTRUZIONI PER L'USO	1
GEBRAUCHSANLEITUNG	3
MODE D'EMPLOI	5
INSTRUCTIONS FOR USE	7
TECHNICAL INFORMATION	9
DESCRIPTION OF THE VACION PUMP	9
TECHNICAL SPECIFICATION	9
OUTLINE DRAWING	13
STRAY MAGNETIC FIELD	14
VACION PLUS PUMP INSTALLATION	15
Inspection procedure	15
Visual inspection	15
Vacuum evaluation	15
Short circuits	15
TYPICAL INSTALLATION	16
INLET FLANGE CONNECTION	16
CONTROL UNIT CONNECTION	17
HEATER INSTALLATION	18
BAKEOUT OPERATION	18
Bakeout of Vaclon pump with the integral heaters	19
MAINTENANCE	19
Exchange of pumping element	19
Exchange of the high voltage feedthrough	19
Leakage current check	20
Hi-potting	20
Heater replacement	20
PUMP TROUBLESHOOTING	21
VACION PLUS PUMP REPLACEMENT PARTS AND ACCESSORIES	22
VACION PLUS PUMP CONTROLLERS	22

INFORMAZIONI GENERALI

Questa apparecchiatura è destinata ad uso professionale. L'utilizzatore deve leggere attentamente il presente manuale di istruzioni ed ogni altra informazione addizionale fornita dalla Varian prima dell'utilizzo dell'apparecchiatura. La Varian si ritiene sollevata da eventuali responsabilità dovute all'inosservanza totale o parziale delle istruzioni, ad uso improprio da parte di personale non addestrato, ad interventi non autorizzati o ad uso contrario alle normative nazionali specifiche.

Le pompe della serie Vaclon Plus sono pompe ioniche utilizzate comunemente per applicazioni di ultra alto vuoto, grazie alla loro pulizia, capacità di pompare qualsiasi tipo di gas, e del loro funzionamento senza vibrazioni e necessità di manutenzione.

Nei paragrafi seguenti sono riportate tutte le informazioni necessarie a garantire la sicurezza dell'operatore durante l'utilizzo dell'apparecchiatura. Informazioni dettagliate sono fornite nell'appendice "Technical information".

Questo manuale utilizza le seguenti convenzioni:



PERICOLO!

I messaggi di pericolo attirano l'attenzione dell'operatore su una procedura o una pratica specifica che, se non eseguita in modo corretto, potrebbe provocare gravi lesioni personali.



ATTENZIONE!

I messaggi di attenzione sono visualizzati prima di procedure che, se non osservate, potrebbero causare danni all'apparecchiatura.

NOTA

Le note contengono informazioni importanti estrapolate dal testo.

PREPARAZIONE PER L'INSTALLAZIONE

La pompa viene fornita in un imballo protettivo speciale; se si presentano segni di danni, che potrebbero essersi verificati durante il trasporto, contattare l'ufficio vendite locale.

Durante l'operazione di disimballaggio, prestare particolare attenzione a non lasciar cadere la pompa e a non sottoporla ad urti o vibrazioni.

Non disperdere l'imballo nell'ambiente. Il materiale è completamente riciclabile e risponde alla direttiva CEE 85/399 per la tutela dell'ambiente.

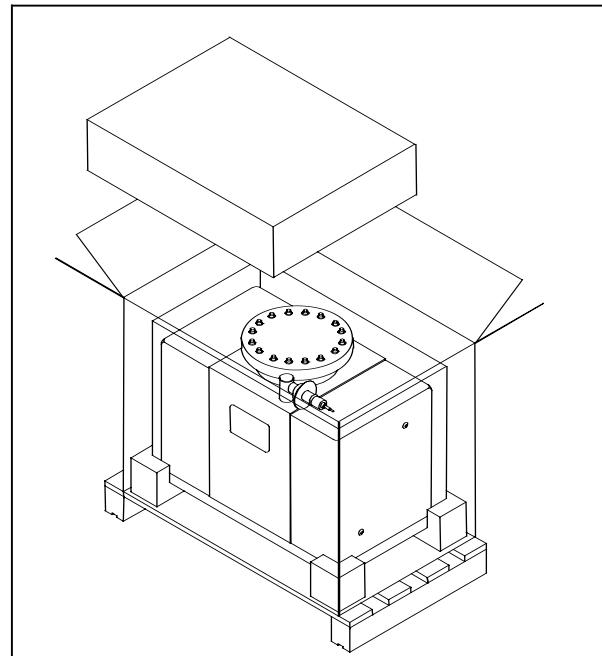


ATTENZIONE!

Onde evitare problemi di degassamento, non toccare con le mani nude i componenti destinati ad essere esposti al vuoto. Utilizzare sempre i guanti o altra protezione adeguata.

NOTA

La pompa non può essere danneggiata rimanendo semplicemente esposta all'atmosfera. Si consiglia comunque di mantenerla chiusa fino al momento dell'installazione sul sistema onde evitare eventuale inquinamento da polvere.



INSTALLAZIONE



PERICOLO!

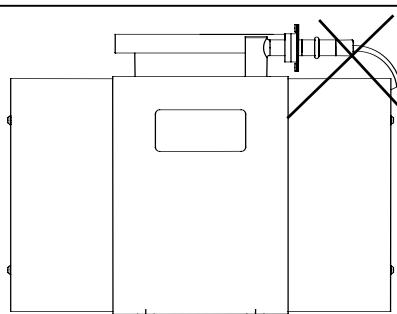
La pompa, a causa del suo peso, deve essere maneggiata tramite appositi attrezzi di sollevamento e spostamento.

Non installare e/o utilizzare la pompa in ambienti esposti ad agenti atmosferici (pioggia, gelo, neve), polveri, gas aggressivi, in ambienti esplosivi o con elevato rischio di incendio. Durante il funzionamento, per ottenere le specifiche tecniche dichiarate, la temperatura ambiente deve essere compresa tra 0 °C e +85 °C.



ATTENZIONE!

La pompa deve essere tenuta sigillata con il suo tubo di ingresso schiacciato finché non è pronta per essere collegata al sistema.



PERICOLO!

Per evitare lesioni alla persona, non collegare l'alta tensione alla pompa prima che sia installata nel sistema e che tutte le flange di ingresso siano adeguatamente collegate o chiuse.

Il funzionamento delle pompe è ottimizzato solo con l'uso delle apposite unità di controllo Varian (Dual, MidiVac o MiniVac).



ATTENZIONE!

Il rispetto delle normative di sicurezza nell'uso delle pompe è garantito solo con l'uso delle unità di controllo Varian.

La pompa Vaclon Plus può essere installata in qualsiasi posizione. Per convenienza normalmente viene montata in posizione verticale con la flangia di ingresso in alto.

Per installazioni con posizione diversa dalla verticale, la pompa deve essere sostenuta tramite i piedini di montaggio posti sul suo fondo.

Per informazioni dettagliate sull'installazione della pompa, vedere l'appendice "Technical Information".

USO

Tutte le istruzioni per il corretto funzionamento delle pompe Vaclon Plus sono contenute nel manuale dell'unità di controllo.

Leggere attentamente tale manuale prima dell'utilizzo.

Si raccomanda di portare la pompa ad una pressione di 1×10^{-4} Torr (mbar) in modo da ottenere un avvio più rapido. A questo scopo è meglio non utilizzare una pompa meccanica sigillata con olio, ma se deve essere utilizzata una tale pompa, si raccomanda di inserire una trappola lungo la linea di vuoto per ridurre la pressione causata dai vapori di acqua e di olio provenienti dalla pompa meccanica. Cercare di ridurre al minimo il tempo in cui la pompa meccanica è aperta verso il sistema e verso la pompa ionica, poiché i suoi vapori si diffondono nel sistema a pressioni inferiori a 1×10^{-1} Torr (mbar) causando una contaminazione dello stesso. Nei sistemi in cui l'olio deve essere completamente assente, è meglio utilizzare pompe Turbo per la suddetta operazione.

Depositi igroscopici e l'assorbimento dell'idrogeno all'interno del composto di titanio possono provocare l'allungamento del tempo di avvio con l'invecchiamento della pompa. Durante l'esposizione all'aria, il deposito del composto di titanio assorbe vapore acqueo; in conseguenza di ciò, al successivo avvio, il riscaldamento della pompa provoca il rilascio del vapore e di parte dell'idrogeno pompato precedentemente, con l'effetto dell'allungamento del tempo di avvio.

Procedure di uso

Controllare che la polarità dell'unità di controllo sia corretta per la pompa.

Fare riferimento al relativo manuale ed osservare la seguente procedura per l'uso della pompa:

- Tramite una pompa di pre-vuoto portare il sistema ad una pressione di 1×10^{-2} Torr (mbar) od inferiore.
- Collegare l'unità di controllo ad una apposita fonte di alimentazione ed accenderla.
- Osservare la tensione, la corrente e la pressione. Se l'avvio è avvenuto ad una pressione di 1×10^{-2} Torr (mbar), è tipica una tensione di circa 300 - 400 V. Un valore di corrente prossimo alla corrente di corto circuito dell'unità di controllo è indice dell'esistenza di una perdita nella pompa e nel sistema. Un temporaneo incremento della pressione di pre-vuoto è normale durante la fase di avvio.
- Lasciare la valvola di pre-vuoto aperta durante l'avvio della pompa ionica finché non si raggiunge una adeguata pressione di avvio. Se la tensione della pompa ionica scende dopo la chiusura della valvola, riaprirla per un prepompaggio aggiuntivo. Appena la pressione diminuisce, la tensione cresce nuovamente e la valvola di pre-vuoto deve essere chiusa.

- Quando la tensione ha raggiunto i 2 - 3kV, mettere l'unità di controllo nello stato PROTECT. Il sistema sarà così autoprotetto dall'incremento della pressione oltre 1×10^{-4} Torr (mbar) quando la pompa non è controllata. Nel caso in cui ci fosse un tale incremento, l'unità di controllo viene spenta automaticamente.
- La pressione nella pompa può anche essere calcolata leggendo la corrente e convertendo la lettura in pressione tramite l'apposito diagramma pressione-corrente illustrato nell'appendice "Technical Information" di questo manuale.

NOTA

I gradini nel diagramma sono una caratteristica del modo di funzionamento del Dual. Quando la corrente assorbita dalla pompa raggiunge determinati valori, l'unità di controllo cambia il valore dell'alta tensione in uscita.

- Quando si porta la pompa alla pressione atmosferica, usare azoto secco in modo da evitare l'assorbimento di vapore acqueo da parte delle pareti della pompa.



PERICOLO!

Quando la pompa viene utilizzata per il pompaggio di gas tossici, infiammabili o radioattivi, seguire le appropriate procedure tipiche di ciascun gas. Non usare la pompa in presenza di gas esplosivi.



PERICOLO!

Quando è installato il riscaldatore, non toccare la pompa durante le operazioni di riscaldamento e di raffreddamento. L'elevata temperatura può causare lesioni alle persone.



ATTENZIONE!

Non avvicinare dispositivi elettronici alla pompa. Il campo magnetico attorno ad essa può provocare dei malfunzionamenti dei dispositivi stessi.

MANUTENZIONE

Le pompe della serie Vaclon Plus non richiedono alcuna manutenzione. Qualsiasi intervento deve essere eseguito da personale autorizzato.



PERICOLO!

Prima di effettuare qualsiasi intervento sulla pompa scollarla dall'alta tensione.

Qualora una pompa dovesse essere rottamata, procedere alla sua eliminazione nel rispetto delle normative nazionali specifiche.

ALLGEMEINE HINWEISE

Dieses Gerät ist für den professionellen Gebrauch bestimmt. Vor dem Gebrauch soll der Benutzer dieses Handbuch sowie alle weiteren von Varian mitgelieferten Zusatzdokumentationen genau lesen. Bei vollständiger bzw. teilweiser Nichtbeachtung der enthaltenen Hinweise, unsachgemäßem Gebrauch durch ungeschultes Personal, nicht autorisierten Eingriffen und Mißachtung der nationalen Bestimmungen übernimmt Firma Varian keinerlei Haftung.

Die Pumpen der Serie Vaclon Plus sind Ionenpumpen, die aufgrund ihrer Reinheit, ihrer Fähigkeit, alle Arten von Gas zu pumpen, und ihres vibrations- und wartungsfreien Betriebes, allgemein für Ultrahochvakuumanwendungen zum Einsatz kommen.

In den folgenden Abschnitten sind alle erforderlichen Informationen für die Sicherheit des Bedieners bei der Anwendung des Geräts aufgeführt. Detaillierte technische Informationen sind im Anhang "Technical Information" enthalten.

In dieser Gebrauchsanleitung werden Sicherheitshinweise folgendermaßen hervorgehoben:



GEFAHR!

Die Gefahrenhinweise lenken die Aufmerksamkeit des Bedieners auf eine spezielle Prozedur oder Praktik, die bei unkorrekter Ausführung schwere Verletzungen hervorrufen könnte.



ACHTUNG!

Die Warnhinweise vor bestimmten Prozeduren machen den Bediener darauf aufmerksam, daß bei Nichteinhaltung Schäden am Gerät entstehen können.

ANMERKUNG

Die Anmerkungen enthalten wichtige Informationen, die aus dem Text hervorgehoben werden.

VOR DER INSTALLATION

Die Pumpe wird in einer speziellen Schutzverpackung geliefert. Eventuelle Transportschäden sind der zuständigen örtlichen Verkaufsstelle zu melden.

Beim Auspacken vorsichtig vorgehen, damit die Pumpe nicht fällt oder Stößen oder Vibrationen ausgesetzt wird.

Das Verpackungsmaterial ist ordnungsgemäß zu entsorgen. Es ist vollständig recyclebar und entspricht der EG-Richtlinie 85/399 für den Umweltschutz.

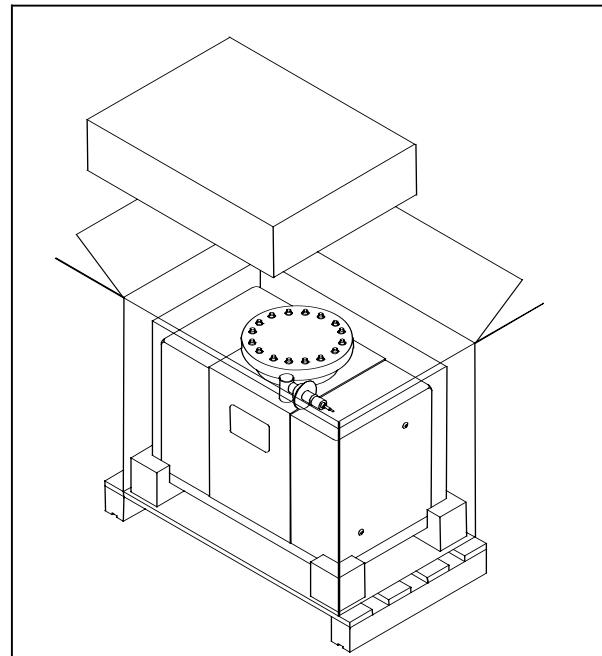


ACHTUNG!

Um Entgasungsprobleme zu vermeiden, dürfen die Komponenten, die mit dem Vakuum in Kontakt kommen, nicht mit bloßen Händen berührt werden. Stets Handschuhe oder einen anderen geeigneten Schutz tragen.

ANMERKUNG

Die Pumpe kann, wenn sie einfach der Atmosphäre ausgesetzt ist, nicht beschädigt werden. Sie sollte jedoch bis zur Installation an der Anlage geschlossen bleiben, um Verunreinigungen durch Staub zu vermeiden.



INSTALLATION



GEFAHR!

Die Pumpe kann aufgrund ihres Gewichtes mittels geeigneter Hebe- und Förderzeuge gehandhabt werden.

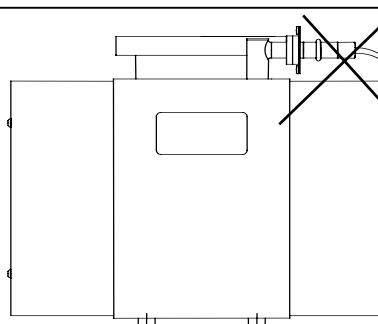
Die Pumpe darf nicht in Umgebungen installiert und/oder benutzt werden, die ungeschützt vor Witterungsbedingungen (Regen, Frost, Schnee), Staub und aggressiven Gasen sind, und in denen Explosions- und erhöhte Brandgefahr besteht.

Während des Betriebes soll die Umgebungstemperatur zwischen 0°C und +85°C betragen, um die angegebenen technischen Merkmale zu gewährleisten.



ACHTUNG!

Die Pumpe soll versiegelt und mit flachgedrücktem Eintrittsschlauch gehalten werden, bis sie für den Anschluß an das System bereit ist.



FALSCH!



GEFAHR!

Um Personenschäden zu vermeiden, darf die Hochspannungsleitung der Pumpe erst angeschlossen werden, wenn die Pumpe im System installiert ist und alle Eintrittsflansche entsprechend angeschlossen oder geschlossen sind.

Der Pumpenbetrieb wird nur durch den Einsatz speziell dafür vorgesehener Varian Steuereinheiten (Dual, MidiVac oder MiniVac) optimiert.



ACHTUNG!

Die Einhaltung der Sicherheitsvorschriften beim Gebrauch der Pumpen ist nur bei Verwendung von Varian Steuereinheiten gewährleistet.

Die Pumpe Vaclon Plus kann in einer beliebigen Position installiert werden. Aus praktischen Gründen wird sie in der Regel senkrecht mit nach oben gerichtetem Eintrittsflansch montiert. Bei nicht senkrechten Einbaulagungen soll die Pumpe auf Montagefüßen aufliegen, die an ihrer Unterseite angebracht werden. Detaillierte Informationen zur Installation der Pumpe sind dem Anhang "Technical Information" zu entnehmen.

GEBRAUCH

Sämtliche Hinweise für den korrekten Betrieb der Pumpen Vaclon Plus sind im Handbuch der Steuereinheit enthalten. Dieses Handbuch ist vor der Inbetriebnahme genau durchzulesen.

Es wird empfohlen, die Pumpe auf einen Druck von 1×10^{-4} Torr (mbar) zu bringen, um einen rascheren Anlauf zu gewährleisten. Zu diesem Zweck empfiehlt es sich, keine översiegelte mechanische Pumpe zu verwenden. Falls hingegen eine derartige Pumpe benutzt werden muß, soll an der Vakuumleitung eine Falle eingesetzt werden, um den durch die Wasser- und Öldämpfe aus der mechanischen Pumpe erzeugten Druck zu verringern. Es ist zu versuchen, die Zeit auf ein Mindestmaß zu reduzieren, während der die mechanische Pumpe zum System und zur Ionenpumpe geöffnet ist, da sich ihre Dämpfe bei Drücken unter 1×10^{-1} Torr (mbar) im System verbreiten und dessen Verunreinigung verursachen. Bei Systemen, die vollkommen ölfrei sein müssen, erweisen sich für den obengenannten Vorgang Turbopumpen als geeigneter.

Hygroskopische Ablagerungen und die Absorption von Wasserstoff in der Titanverbindung können die Anlaufzeit verlängern und eine kürzere Standzeit der Pumpe verursachen. Die Ablagerungen der Titanverbindungen absorbieren Wasserdampf, wenn sie der Luft ausgesetzt werden. Dadurch bewirkt beim anschließenden Anlaufvorgang die Aufheizung der Pumpe die Abgabe des Dampfes und eines Teils des zuvor gepumpten Wasserstoffs, so daß sich die Anlaufzeit verlängert.

Bedienungsschritte

Es ist zu kontrollieren, daß die Steuereinheit in bezug auf die Pumpe richtig gepolt ist.

Es ist nach dem diesbezüglichen Handbuch vorzugehen, für den Gebrauch der Pumpe sind die folgenden Bedienungsschritte zu beachten:

1. Mittels einer Vorvakumpumpe das System auf einen Druck von 1×10^{-2} Torr (mbar) oder einen niedrigeren Druck bringen.
2. Die Steuereinheit an eine entsprechende Versorgungsquelle anschließen und einschalten.
3. Die Spannung, die Stromstärke und den Druck beobachten. Wenn der Anlauf bei einem Druck von 1×10^{-2} Torr (mbar) erfolgt ist, ist eine Spannung von ca. 300 – 400 V typisch. Ein Stromwert, der sich dem Kurzschlußstromwert der Steuereinheit annähert, weist auf eine Leckstelle an der Pumpe und am System hin. Ein zeitweiliger Anstieg des Vorvakuumdruckes ist während der Anlaufphase normal.
4. Während des Anlaufes der Ionenpumpe soll das Vorvakuumventil geöffnet bleiben, bis ein angemessener Anlaufdruck erreicht ist. Wenn die Spannung der Ionenpumpe nach Schließung des Ventils abfällt, ist das Ventil für eine zusätzliche Vorvakumpumpung zu öffnen. Sobald der Druck sinkt, steigt die Spannung erneut an und ist das Vorvakuumventil zu schließen.

5. Wenn die Spannung 2 – 3 kV erreicht hat, ist die Steuereinheit auf den Status PROTECT zu schalten. Das System verfügt auf diese Weise über einen Selbstschutz vor einem Druckanstieg über 1×10^{-4} Torr (mbar), wenn die Pumpe nicht kontrolliert ist. Falls ein solcher Anstieg stattfindet, wird die Steuereinheit automatisch ausgeschaltet.

6. Der Pumpendruck kann auch berechnet werden, indem die Stromstärke abgelesen wird und der abgelesene Wert mittels des Druck-Stromstärke-Diagramms im Anhang "Technical Information" des vorliegenden Handbuchs in einen Druckwert umgerechnet wird.

ANMERKUNG

Die Stufen im Diagramm sind eine Charakteristik der Arbeitsweise der Pumpe Dual. Wenn der von der Pumpe aufgenommene Strom bestimmte Werte erreicht, ändert die Steuereinheit den Ausgangswert der Hochspannung.

7. Wenn die Pumpe auf den atmosphärischen Druck gebracht wird, ist trockener Stickstoff zu verwenden, um die Aufnahme von Wasserdampf durch die Pumpenwände zu verhindern.



GEFAHR!

Wenn die Pumpe zur Förderung von giftigen, leicht entflammabaren oder radioaktiven Gasen benutzt wird, sind die für das jeweilige Gas vorgeschriebenen Vorgänge zu befolgen. Die Pumpe nie bei Vorhandensein von explosivem Gas benutzen.



GEFAHR!

Wenn die Heizung installiert ist, darf die Pumpe während der Aufheizung und Abkühlung nicht berührt werden. Die hohe Temperatur kann zu Personenschäden führen.



ACHTUNG!

Keine elektronischen Geräte in die Nähe der Pumpe bringen. Das darum befindliche Magnetfeld kann zu Funktionsstörungen der Geräte führen.

WARTUNG

Die Pumpen der Serie Vaclon Plus erfordern keine Wartung. Sämtliche Eingriffe dürfen nur von autorisiertem Personal vorgenommen werden.



GEFAHR!

Vor Eingriffen an der Pumpe ist diese von der Hochspannungsquelle zu trennen.

Bei eventueller Verschrottung einer Pumpe ist diese entsprechend der einschlägigen nationalen Vorschriften zu entsorgen.

INDICATIONS GÉNÉRALES

Cet appareillage a été conçu en vue d'une utilisation professionnelle. Il est conseillé à l'utilisateur de lire attentivement cette notice d'instructions ainsi que toute autre indication supplémentaire fournie par Varian avant d'utiliser l'appareil. Varian décline toute responsabilité en cas de non respect total ou partiel des instructions fournies, d'opérations non autorisées, d'utilisation impropre par du personnel non formé ou contraires aux réglementations nationales spécifiques.

Grâce à leur propétés, à leur capacité de pomper tous les types de gaz, à leur fonctionnement sans vibrations et à l'absence d'entretien, les pompes de la série Vacion Plus sont des pompes ioniques généralement utilisées pour des applications de vide ultra poussé.

Les paragraphes suivants fournissent toutes les indications nécessaires à garantir la sécurité de l'opérateur pendant l'utilisation de l'appareillage. Des renseignements plus détaillés se trouvent dans l'appendice "Technical Information".

Cette notice utilise les signes conventionnels suivants:



DANGER!

Les messages de danger attirent l'attention de l'opérateur sur une procédure ou une manœuvre spéciale dont la mauvaise exécution peut provoquer de graves lésions.



ATTENTION!

Les messages d'attention apparaissent avant certaines procédures dont le non respect peut provoquer des dommages irréversibles à l'appareillage.

NOTE

Les notes contiennent des renseignements importants, extrapolés du texte.

PRÉPARATION DE L'INSTALLATION

La pompe est fournie dans un emballage de protection spécial; si l'on constate des signes d'endommagement imputables au transport, contacter aussitôt le revendeur local.

Pendant l'opération de déballage, veiller tout particulièrement à ne pas laisser tomber la pompe et à ne lui faire subir aucun choc ni aucune vibration.

Ne pas abandonner l'emballage dans la nature. Le matériel est entièrement recyclable et il est conforme à la directive CEE 85/399 en matière de protection de l'environnement.

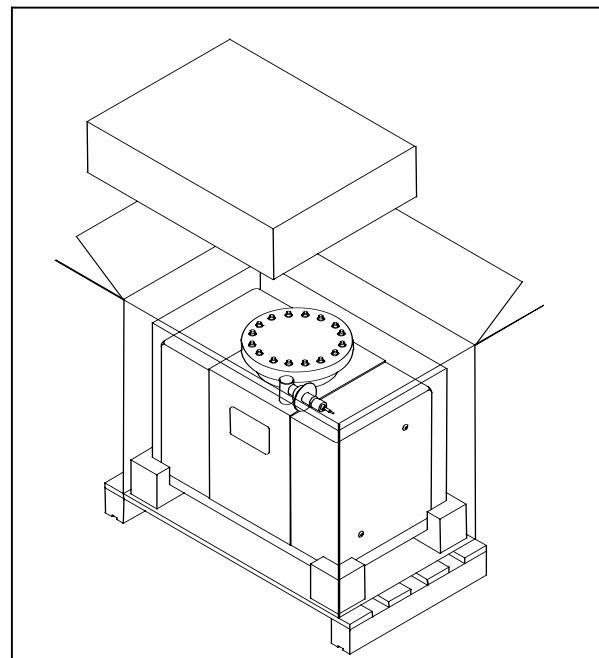


ATTENTION!

En vue d'éviter tout problème de dégazage, ne pas toucher à mains nues les éléments devant être exposés au vide. Mettre toujours des gants ou toute autre protection appropriée.

NOTE

La pompe ne peut être endommagée si elle reste simplement exposée à l'atmosphère. Il est quoi qu'il en soit conseillé de ne pas la retirer de son emballage avant le moment de l'installation, afin d'éviter toute pollution due à la poussière.



INSTALLATION



DANGER!

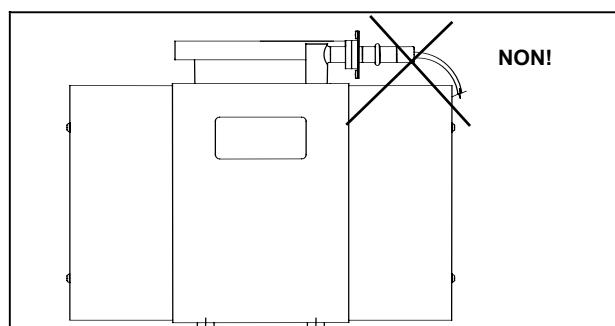
À cause de son poids, il est indispensable de se servir des équipements de levage et de manutention pour déplacer la pompe.

Ne pas installer et/ou utiliser la pompe dans des milieux exposés à des agents atmosphériques (pluie, gel, neige), à des poussières, à des gaz de combat ainsi que dans des milieux explosifs ou à fort risque d'incendie. Pendant le fonctionnement, pour respecter les spécifications techniques déclarées la température ambiante doit être comprise entre 0°C et +85°C;



ATTENTION!

La pompe doit être conservée scellée avec son tuyau d'entrée aplati jusqu'à ce qu'elle soit prête à être branchée au système.



DANGER!

Pour éviter toute lésion aux personnes, ne pas brancher la haute tension à la pompe avant que celle-ci soit installée dans le système et avant que toutes les brides d'entrées soient correctement assemblées ou fermées.

Le fonctionnement de la pompe n'est optimisé que si celle-ci est utilisée avec l'une des unités de contrôle Varian spécifiques (Dual, MidiVac ou MiniVac).



ATTENTION!

Lors de l'utilisation des pompes, le respect des normes de sécurité est impérativement subordonné à l'emploi des unités de contrôle Varian.

La pompe Vacion *Plus* peut être installée dans toutes les positions. Par facilité elle est généralement montée en position verticale avec la bride d'entrée en partie haute.

Pour toute installation différente de la position verticale, la pompe doit reposer sur ses pieds de montage placé sur le fond. Pour plus de détails sur l'installation de la pompe, consulter l'appendice "Technical information".

UTILISATION

Toutes les instructions pour le fonctionnement correct de la pompe Vacion *Plus* sont fournies dans la notice de l'unité de contrôle.

Il est conseillé de lire attentivement cette notice avant d'utiliser la pompe.

Il est recommandé de porter la pompe à une pression de 1×10^{-4} Torrs (mbars) de façon à obtenir un démarrage plus rapide. Pour ce faire il est préférable de ne pas utiliser une pompe mécanique scellée à l'huile mais au cas où il serait nécessaire d'utiliser une telle pompe, il est recommandé d'introduire un dispositif de retenue le long de la ligne de vide afin de réduire la pression due aux vapeurs d'eau et d'huile engendrées par la pompe mécanique. Essayer de réduire au minimum le temps où la pompe mécanique est ouverte vers le système et vers la pompe ionique car ses vapeurs se répandent dans le système à des pressions inférieures à 1×10^{-1} Torrs (mbars) causant une contamination de celui-ci. Dans les systèmes où l'huile doit être complètement absente, il est préférable d'effectuer ladite opération à l'aide d'une pompe Turbo.

Des dépôts hygroscopiques et l'absorption d'hydrogène dans le composé de titane peuvent provoquer, par effet du vieillissement de la pompe, l'allongement du temps de démarrage. Pendant l'exposition à l'air, le dépôt du composé de titane absorbe de la vapeur d'eau et cette action a pour conséquence qu'au démarrage suivant le chauffage de la pompe entraînera la dispersion de la vapeur et d'une partie de l'hydrogène pompée précédemment ce qui aura pour effet d'allonger le temps de démarrage.

Procédure d'utilisation

Contrôler que la polarité de l'unité de contrôle soit correcte pour la pompe.

Se reporter au manuel correspondant et observer la procédure suivante pour l'utilisation de la pompe:

1. A l'aide d'une pompe de pré-vide, porter le système à une pression de 1×10^{-2} Torrs (mbars) ou inférieure.
2. Brancher l'unité de contrôle à une source d'alimentation appropriée et l'allumer.
3. Contrôler la tension, le courant et la pression. Lorsque la mise en route est effectuée à une pression de 1×10^{-2} Torrs (mbars) la tension est généralement d'environ 300 - 400 V. Une valeur de courant proche du courant de court-circuit de l'unité de contrôle révèle l'existence d'une fuite dans la pompe et dans le système. Au cours de la phase de démarrage, un accroissement momentané de la pression de pré-vide est normal.

4. Laisser la soupape de pré-vide ouverte pendant le démarrage de la pompe ionique tant qu'une pression de démarrage appropriée n'a pas été atteinte. Si la tension de la pompe ionique descend après la fermeture de la soupape, la rouvrir pour un pré-pompage supplémentaire. Dès que la pression diminue, la tension remonte et la soupape de pré-vide doit être refermée.
5. Lorsque la tension a atteint 2 - 3 kV, mettre l'unité de contrôle en état de PROTECT. Le système sera ainsi protégé contre toute augmentation de pression au-delà de 1×10^{-4} Torrs (mbars) lorsque la pompe n'est pas contrôlée. Si une telle augmentation devait être enregistrée, l'unité de contrôle s'éteindrait automatiquement.
6. La pression de la pompe peut également être calculée en relevant le courant et en convertissant la lecture en pression à l'aide du diagramme pression-courant illustré dans l'appendice "Technical Information" de ce manuel.

NOTE

Les paliers du diagramme sont caractéristiques du mode de fonctionnement du Dual. Lorsque le courant absorbé par la pompe atteint des valeurs déterminées, l'unité de contrôle change la valeur de la haute tension en sortie.

7. Lorsque l'on porte la pompe à la pression atmosphérique, utiliser de l'azote sec de façon à éviter que les parois de la pompe n'absorbent de la vapeur aqueuse.



DANGER!

Lorsque la pompe est utilisée pour le pompage de gaz toxiques, inflammables ou radioactifs, suivre les procédures appropriées à chaque gaz. Ne pas utiliser la pompe en présence de gaz explosifs.



DANGER!

Lorsque le réchauffeur est installé, éviter de toucher la pompe pendant les opérations de chauffage et de refroidissement. La température élevée peut provoquer des brûlures.



ATTENTION!

Ne pas approcher de dispositifs électroniques de la pompe. Le champ magnétique environnant cette dernière peut entraîner des dysfonctionnements desdits dispositifs.

MAINTENANCE

Les pompes de la série Vacion *Plus* ne demandent aucun entretien. Toute intervention doit être exécutée par un personnel agréé.



DANGER!

Avant toute intervention sur la pompe, la débrancher de la haute tension.

En cas de mise au rebut d'une pompe, procéder à son élimination dans le respect des normes nationales en vigueur.

GENERAL INFORMATION

This equipment is destined for use by professionals. The user should read this instruction manual and any other additional information supplied by Varian before operating the equipment. Varian will not be held responsible for any events occurring due to non-compliance, even partial, with these instructions, improper use by untrained persons, non-authorized interference with the equipment or any action contrary to that provided for by specific national standards.

The Vaclon Plus series pumps are ion pumps commonly used to create ultra-high vacuum, due to their cleanliness, ability to pump different gases, and maintenance- and vibration-free operation.

The following paragraphs contain all the information necessary to guarantee the safety of the operator when using the equipment. Detailed information is supplied in the appendix "Technical Information".

This manual uses the following standard protocol:



WARNING!

The warning messages are for attracting the attention of the operator to a particular procedure or practice which, if not followed correctly, could lead to serious injury.



CAUTION

The caution messages are displayed before procedures which, if not followed, could cause damage to the equipment.

NOTE

The notes contain important information taken from the text.

PREPARATION FOR INSTALLATION

The pump is supplied in a special protective packing. If this shows signs of damage which may have occurred during transport, contact your local sales office.

When unpacking the pump, be sure not to drop it and avoid any kind of sudden impact or shock vibration to it.

Do not dispose of the packing materials in an unauthorized manner. The material is 100% recyclable and complies with EEC Directive 85/399.

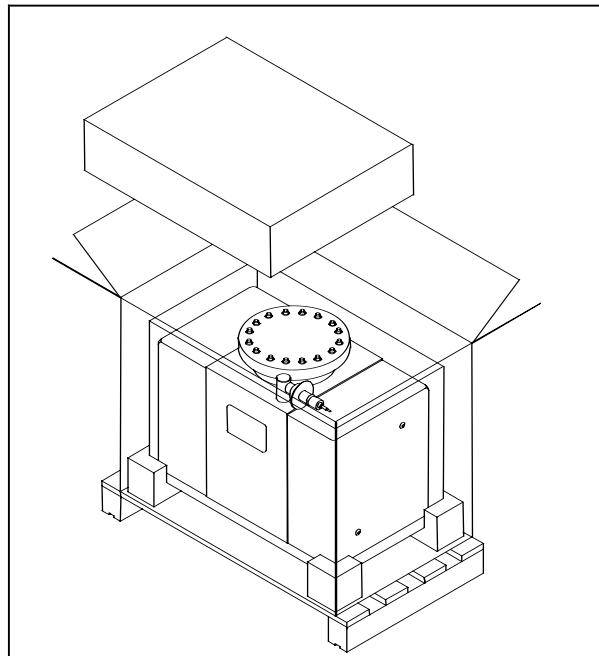


CAUTION

In order to prevent outgassing problems, do not use bare hands to handle components which will be exposed to vacuum. Always use gloves or other appropriate protection.

NOTE

Normal exposure to the environment cannot damage the pump. Nevertheless, it is advisable to keep it closed until it is installed in the system, thus preventing any form of pollution by dust.



INSTALLATION



WARNING!

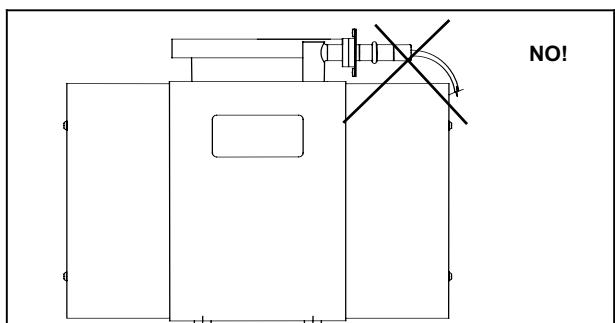
Cause its weight, the pump must be handled by means of suitable moving and handling tools.

Do not install or use the pump in an environment exposed to atmospheric agents (rain, snow, ice), dust, aggressive gases, or in explosive environments or those with a high fire risk. During operation, to obtain the declared functioning specification, the ambient temperature must be between 0 °C and +85 °C.



CAUTION

The pump should be kept sealed with its pinch-off tubulation until it is ready for attachment to the vacuum system.



NO!



WARNING!

To avoid injury, never connect the high voltage to the pump before it is installed into the system and all the inlet flanges are properly connected or blanked off.

The pump operation is optimized using one of the special Varian controllers (Dual, MidiVac or MiniVac) only.



CAUTION

The safety specifications agreement using the pump is guaranteed using the Varian controller only.

The Vaclon *Plus* pump can be installed in any position. For convenience, a pump is usually mounted vertically with the inlet up.

For mounting other than vertical, the pump should be supported using the mounting feet at the bottom of the pump.

For detailed information about the pump installation, see the appendix "Technical Information".

USE

All the instructions for the correct use of the Vaclon *Plus* pumps are contained in the control unit manual.

Read the manual carefully before using the pump.

Rough pumping down to 1×10^{-4} Torr (mbar) is recommended for the most rapid starting. Roughing with an oil-sealed mechanical pump is not desirable, but when used, a trap in the roughing line is recommended to reduce pressure due to water vapor and oils from the mechanical pump. Be careful to minimize the time that this pump is open to the system and ion pump, since mechanical pump vapors will start diffusing into the system at pressures below 1×10^{-1} Torr (mbar) and cause contamination. In systems where oils must be completely eliminated, turbopump roughing pumps should be used.

Hygroscopic deposits and hydrogen absorption into titanium may cause starting times to increase with age. During exposure to air, the deposits of titanium compound absorb water vapor. In subsequent start ups, pump heating causes release of the water vapor and some previously pumped hydrogen; thus, the starting time may be lengthened.

Operating procedure

Check that the controller HV polarity is correct for the pump. Refer to the relevant pump control unit instruction manual and follow the procedure below when operating the pump:

- With a clean roughing pump, establish a roughing pressure of 1×10^{-2} Torr (mbar) or lower in the vacuum system.
- Plug the control unit into a suitable power source and switch the power ON.
- Observe the voltage, current, and roughing pressure. If started at 1×10^{-2} Torr (mbar), a controller voltage of approximately 300 to 400 volts is typical. A current value near the short-circuit current of the control unit could indicate that an unconfined flow discharge exists in the pump and system. A temporary rise in roughing pressure will usually be noticed during any starting procedure.
- Allow the roughing valve to remain open after turning on the ion pump until an adequate starting pressure is reached. If the ion pump voltage drops after closing the roughing valves, reopen the valve for additional rough pumping. As the pressure decreases, the voltage again will rise, and the roughing valve should be closed.

- When the voltage has increased to 2-3 kV, place the control unit in the PROTECT condition. The system is now automatically protected against pressure increases to 10^{-4} Torr (mbar) when the pump is left unattended. If such an increase should occur, the control unit will be turned off automatically.
- The pressure in the pump can also be determined by reading the current and converting this reading to pressure with the appropriate pressure versus current graph shown in the appendix "Technical Information" of this manual.

NOTE

The steps on the charts are a characteristic of the Dual step voltage operation. When the current drawn by the Vaclon pump reaches the determinated values, the controller change the high voltage output.

- When venting the pump, use dry nitrogen. This will avoid water vapor absorption on the pump walls.



WARNING!

When employing the pump for pumping toxic, flammable, or radioactive gases, please follow the required procedures for each gas disposal.

Do not use the pump in presence of explosive gases.



WARNING!

When the heating element is installed, do not touch the pump during the heating and cooling phases. The high temperature may cause a serious damage.



CAUTION

Do not put any electronic device near the pump otherwise the magnetic field around it may cause a device malfunctioning.

MAINTENANCE

The Vaclon *Plus* series pump does not require any maintenance. Any work performed on the pump must be carried out by authorized personnel.



WARNING!

Before carrying out any work on the pump, disconnect it from the High Voltage supply.

If a pump is to be scrapped, it must be disposed of in accordance with the specific national standards.

DESCRIPTION OF THE VACION PUMP

The Varian Vaclon Plus 300 pumps are ion pumps and are available in four types:

- StarCell
- Triode
- Noble Diode
- Diode

They operate in the pressure range from 10^{-2} to below 10^{-11} Torr (mbar).

The Vaclon Plus Triode and StarCell pumps allow starting from as high as 5×10^{-2} Torr (6.6×10^{-2} mbar), because ions are prevented from bombarding the system and pump walls at starting pressures, and have high speed for inert gases. The Vaclon Plus Diode and Noble Diode pumps require a lower starting pressure (i.e. 10^{-2} Torr (mbar)). The Diode contains more titanium than triode pumps, and thus has a higher hydrogen capacity and longer life.

The tantalum in the Noble Diode pump enhances the noble gas pumping capacity, although it somewhat reduces the high getterable gas pumping speed that the standard diode pump provides.

The Vaclon Plus StarCell is the latest variation of the Triode configuration. Its patented design makes this ion pump the only one that can handle a high amount of Noble Gases (equal or better than Noble Diode and Triode) and Hydrogen (comparable to the Diode).

A positive polarity, high voltage supply is required to operate Diode and Noble Diode pumps. A negative polarity high voltage supply is required to operate Triode and StarCell pumps. The anode is grounded and the cathode is held at negative potential.

The inlet ConFlat flange is a 8" (NW 150).

Fig. 1 shows the Vaclon Plus 300 pump, Fig. 2 shows the main assemblies of the pump.

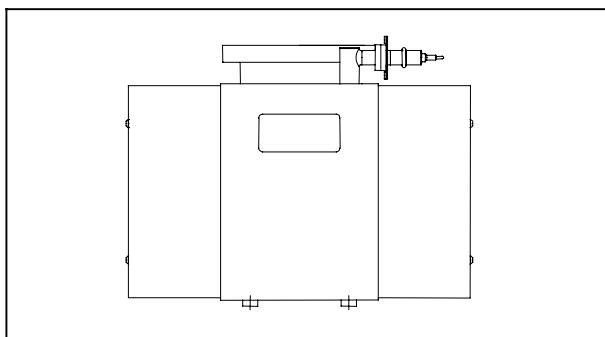


Fig. 1 - Vaclon Plus 300 pump

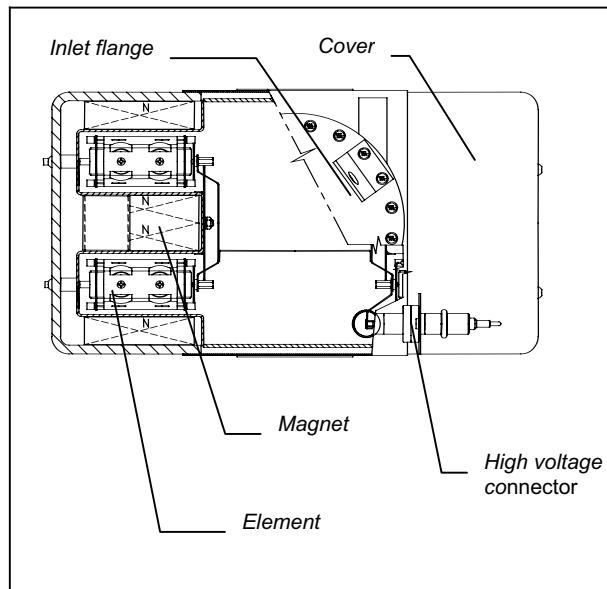


Fig. 2 - Pump main assemblies

TECHNICAL SPECIFICATION

The following table details the main technical specifications of the Vaclon Plus 300 pumps.

MODEL SPECIFICATION	STAR CELL	TRIODE	NOBLE DIODE	DIODE
Nominal pumping speed for Nitrogen (*) (l/s)	240	230	260	300
Operating life at 1×10^{-6} mbar (hours)	80,000	35,000	50,000	50,000
Operating voltage (max)	-7000 Vdc +/- 10%		+7000 Vdc +/- 10%	
Maximum starting pressure (mbar)	$\leq 1 \times 10^{-2}$		$\leq 1 \times 10^{-3}$	
Ultimate pressure			Below 10^{-11}	
Inlet flange			8" CFF (NW 150) AISI 304 ESR	
Internal volume (litres)			18.6	
Maximum baking temperature (°C)			350	
Temperature limits (°C): Pump Magnet Flange			400 350 500	
Material: Body			AISI 304 SST	
Cathode		Titanium	Tita-nium/Tan-talum	Titanium
Anode			AISI 304 SST	
Magnet			Ferrite	
Weight, lbs (kg)			149 (69)	

(*) Tested according to ISO/DIS 3556-1-1992

Figures 3 to 13 show the pumping speed vs pressure diagrams for saturated and unsaturated pumps and the pressure vs current diagrams for the same pump. The diagrams are for pumps controlled by means of a Dual controller.

NOTE

The steps on the diagrams are characteristic of the Dual step operation: steps occur whenever the current reaches a value at which the Dual controller output varies.

The pumping speed of a newly regenerated (i.e. baked) sputter ion pump decreases during operation until it reaches a stabilized level known as "saturation" (nominal pumping speed). To saturate the Vaclon Plus 300 pumps, it normally requires an amount of gas equal to 2.5 Torr-litres. Consequently, pumps can operate for extended periods of time at low pressures in the non-saturated state, if they are properly conditioned.

VACION PLUS 300 STARCELL

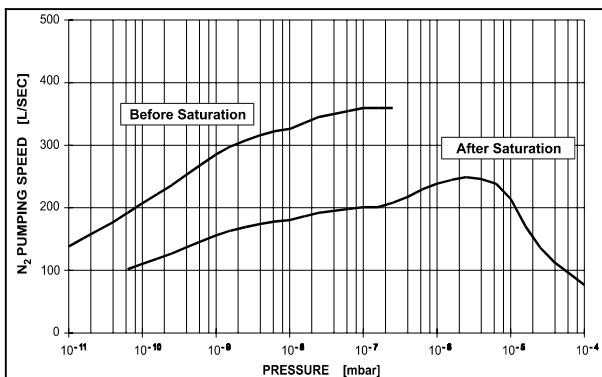


Fig. 3 - Pumping speed vs pressure for Nitrogen

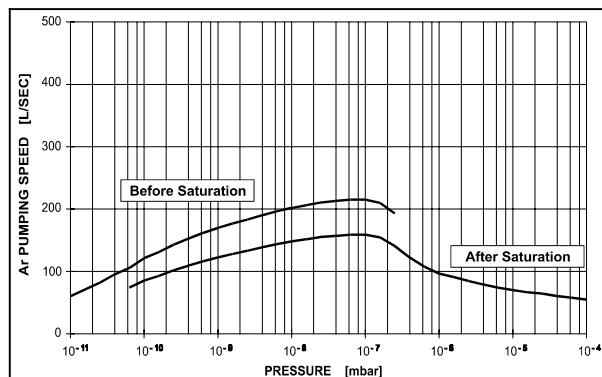


Fig. 4 - Pumping speed vs pressure for Argon

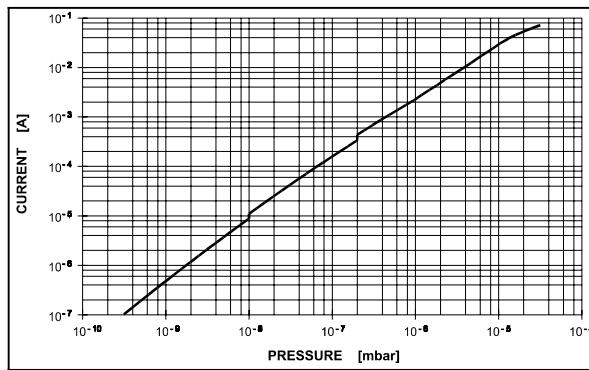


Fig. 5 - Pressure vs current diagram

VACION PLUS 300 TRIODE

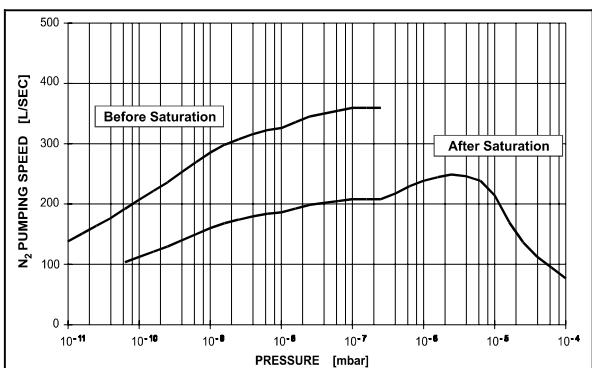


Fig. 6 - Pumping speed vs pressure for Nitrogen

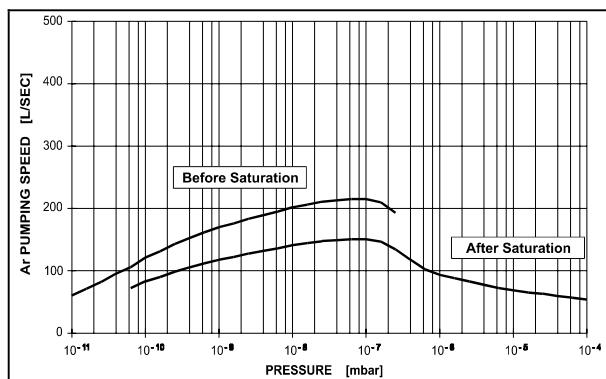


Fig. 7 - Pumping speed vs pressure for Argon

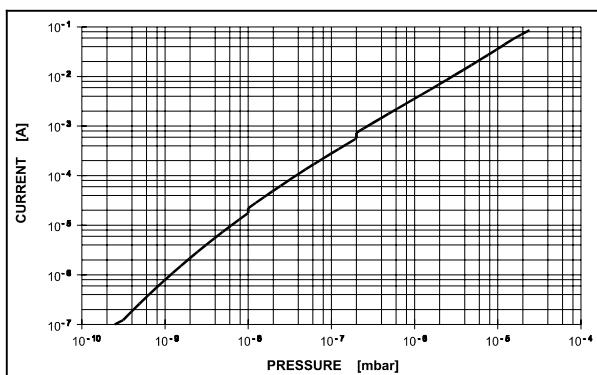


Fig. 8 - Pressure vs current diagram

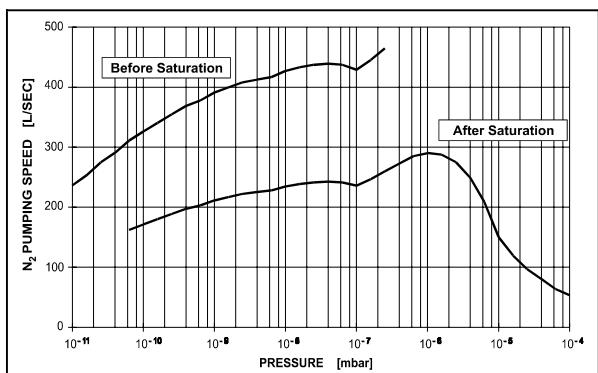
VACION PLUS 300 DIODE

Fig. 9 - Pumping speed vs pressure for Nitrogen

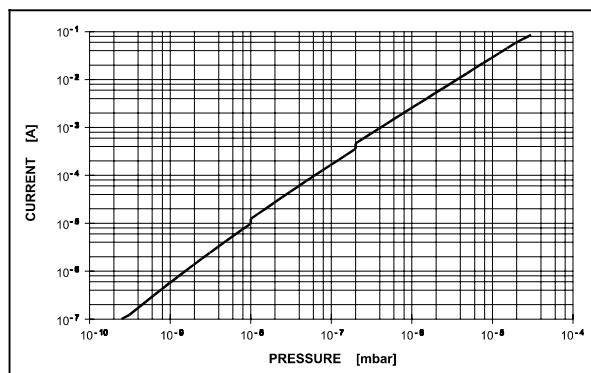


Fig. 10 - Pressure vs current diagram

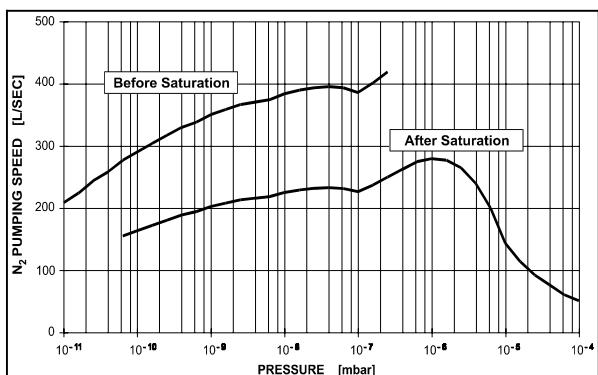
VACION PLUS 300 NOBLE DIODE

Fig. 11 - Pumping speed vs pressure for Nitrogen

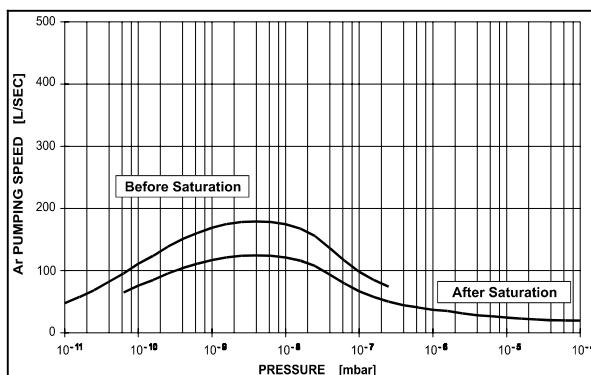


Fig. 12 - Pumping speed vs pressure for Argon

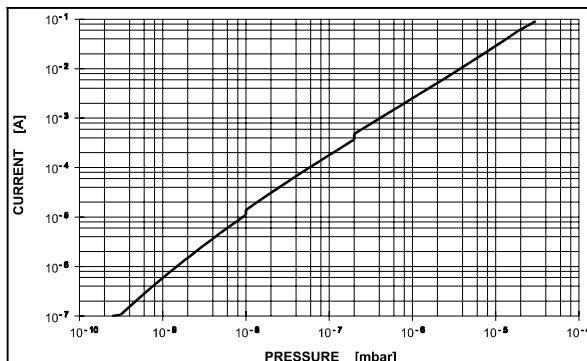


Fig. 13 - Pressure vs current diagram

OUTLINE DRAWING

The following figure shows the outline drawing for the Vaclon Plus pump.

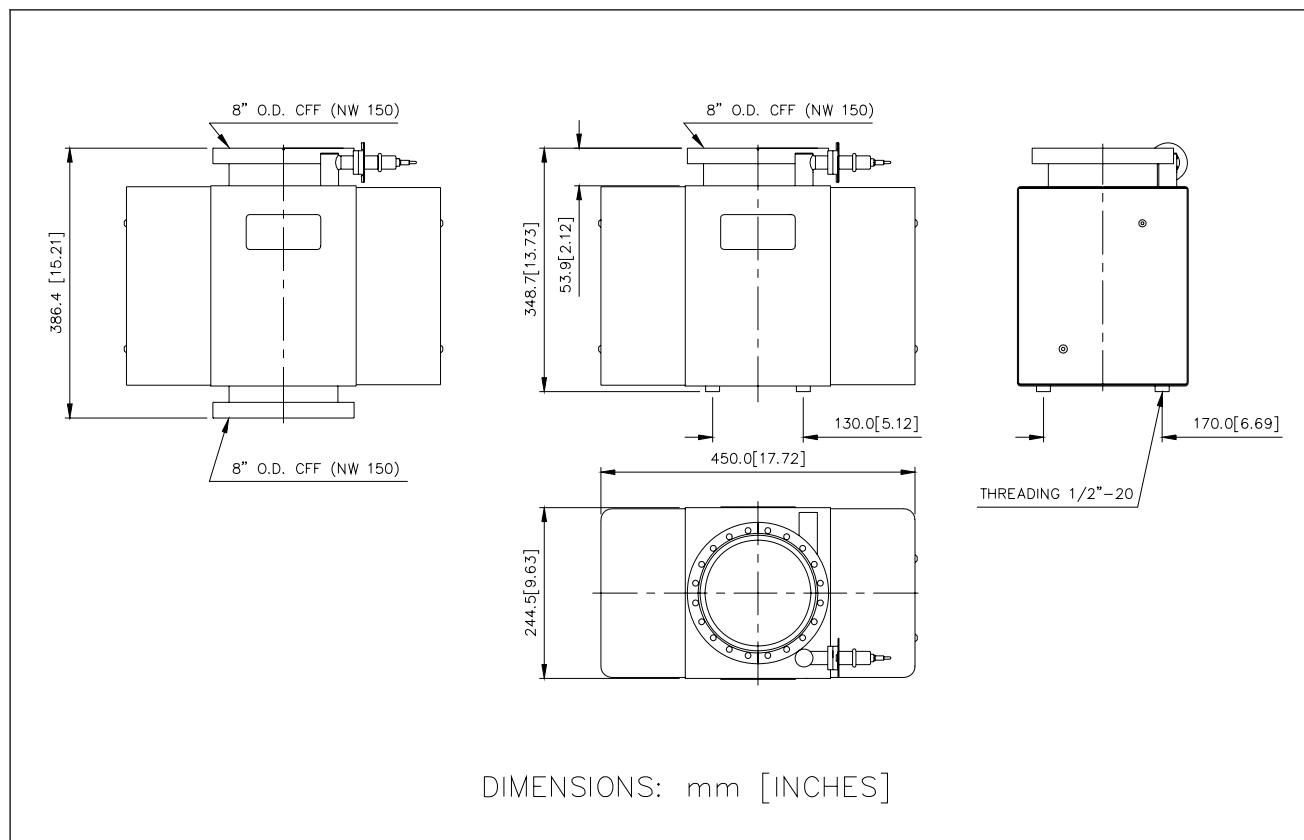


Fig. 14 - Vaclon Plus pump outline drawing

STRAY MAGNETIC FIELD

Curves of stray magnetic field strength along the centre line of the pump and in the plane of the flange as a function of distance from the pump are shown in Figs. 16, 17, 18, 19 and 20, where B_x is the magnetic field along X axis, B_y is the one along Y axis and B_z is the one along Z axis.

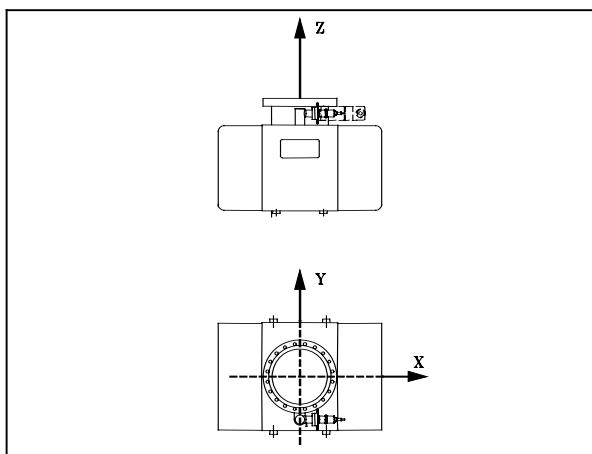


Fig. 15 - Vaclon Plus pump axis identification

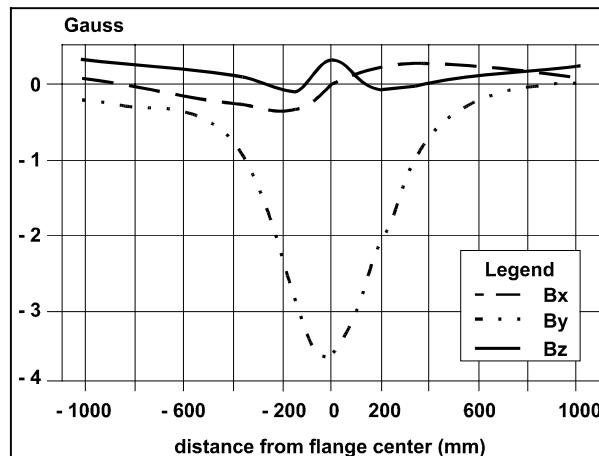


Fig. 16 - Stray magnetic field from flange along X axis ($z = 0$ mm)

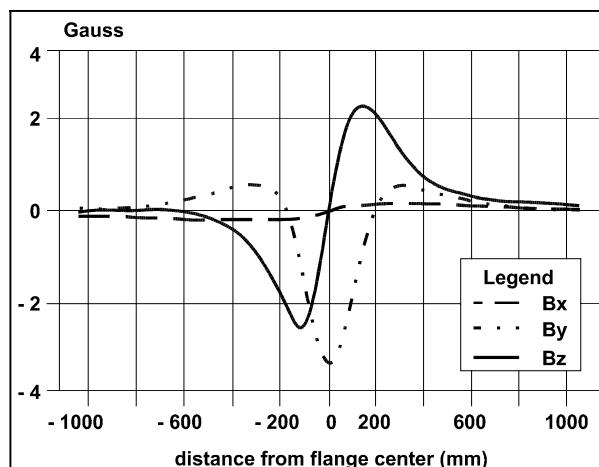


Fig. 17 - Stray magnetic field from flange along Y axis ($z = 0$ mm)

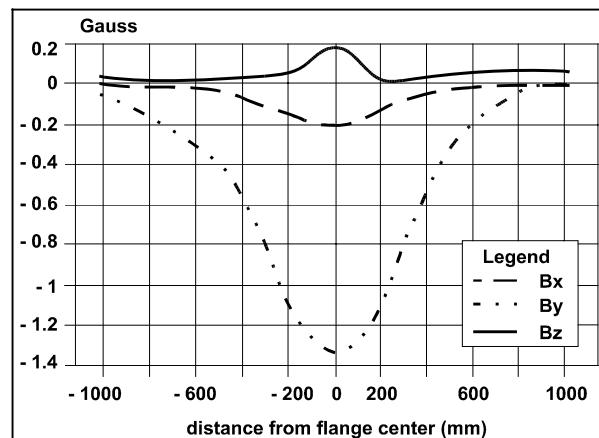


Fig. 18 - Stray magnetic field from flange along X axis ($z = 100$ mm)

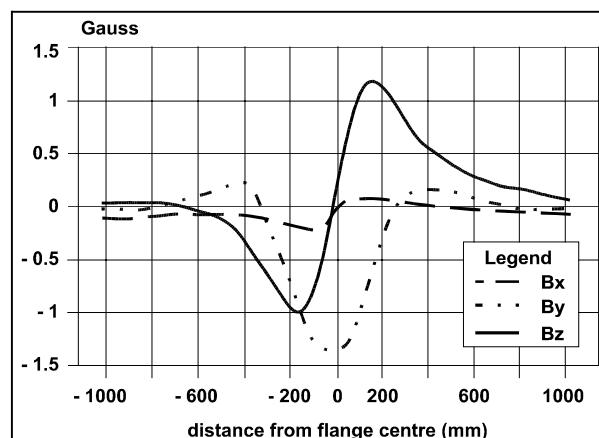


Fig. 19 - Stray magnetic field from flange along Y axis ($z = 100$ mm)

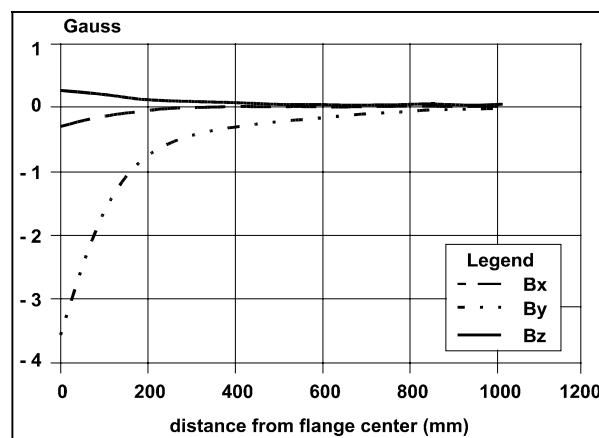


Fig. 20 - Stray magnetic field from flange along Z axis

VACION PLUS PUMP INSTALLATION

Inspection procedure

Vaclon Plus pumps are evacuated, baked out, sealed and leak-checked at below 1×10^{-10} Torr (mbar) prior to shipping.

The following information and procedures can be used to optimize the vacuum integrity of a Vaclon Plus pump before installation.

Visual inspection

Inspect the pump and magnet for physical damage which may have occurred during shipment. Examine, in particular, the brazed joints on the high voltage feedthrough.

Inspect the pinch-off seal. If it is open, the pump is at atmospheric pressure.



WARNING!

The pinch-off seal is extremely sharp. Be careful.

A Vaclon Plus pump that has been exposed to atmosphere during shipment, or while in storage, will operate properly if it has not been damaged.

The pump is not harmed by such exposure, although it is good practice to keep it under vacuum when not in use to exclude dust and the accumulation of water vapor from the environment.

Vacuum evaluation

To determine the vacuum level of the new pump before air releasing it:

1. Connect the pump to the control unit as directed in the instruction manual of the control unit.



WARNING!

The high voltage which is present in the ion pump when it is powered from the power unit can cause severe injury or death.

Be sure the garter spring is mounted on the high voltage feedthrough because the ground connection is brought from the control unit to the pump body through the garter spring. An additional safety ground connection for the pump body is made through the fixing screws of the H.V. cable connector.

2. With the main power switch in the OFF position, plug the control unit into a suitable power source.
3. Turn the power to ON.
4. Observe the reading for an indication of one of the following conditions:
 - If the pump is free of leaks and is at a low pressure, the pressure indication shall quickly fall to or below the 10^{-8} Torr (mbar) range as the volume of gas is pumped.
 - If the pressure inside the pump is at or near atmospheric level, an arc may strike inside the high voltage feedthrough giving a popping sound and the pump current will fluctuate. If this occurs, turn the power OFF immediately.
5. If the vacuum integrity has been lost, the pump should be leak-checked with a mass spectrometer leak detector before installation on the system.

Short circuits

If there is a short circuit between the anode and cathodes in the pump (or cathode to pump body), the short-circuit current of the control unit will be drawn and low voltage will be indicated. If a short circuit exists in the control unit or high voltage cable and connector, low voltage will also be observed when the high voltage connector is disconnected from the pump (refer to the control unit manuals).

An ohm meter reading on the pump feedthrough may not be effective in finding a short.

Short circuits may be caused by mechanical shock to the pump. If the pump is shorted, contact Varian.

TYPICAL INSTALLATION

A typical installation is shown in Fig. 21 and consists of:

1. VacIon Plus pump.
2. A Valve to seal off the pump from the rest of the system (if required).
3. The control unit.
4. A clean roughing pump (i.e. turbo or sorption).
5. A thermocouple gauge capable of indicating pressure from atmosphere to 10^{-3} Torr/mbar range.
6. A valve to seal off the roughing pump from the vacuum chamber. Roughing lines, are usually made of stainless steel or copper tubing, or other low vapour pressure material.
7. High voltage cable.
8. Backing pump.

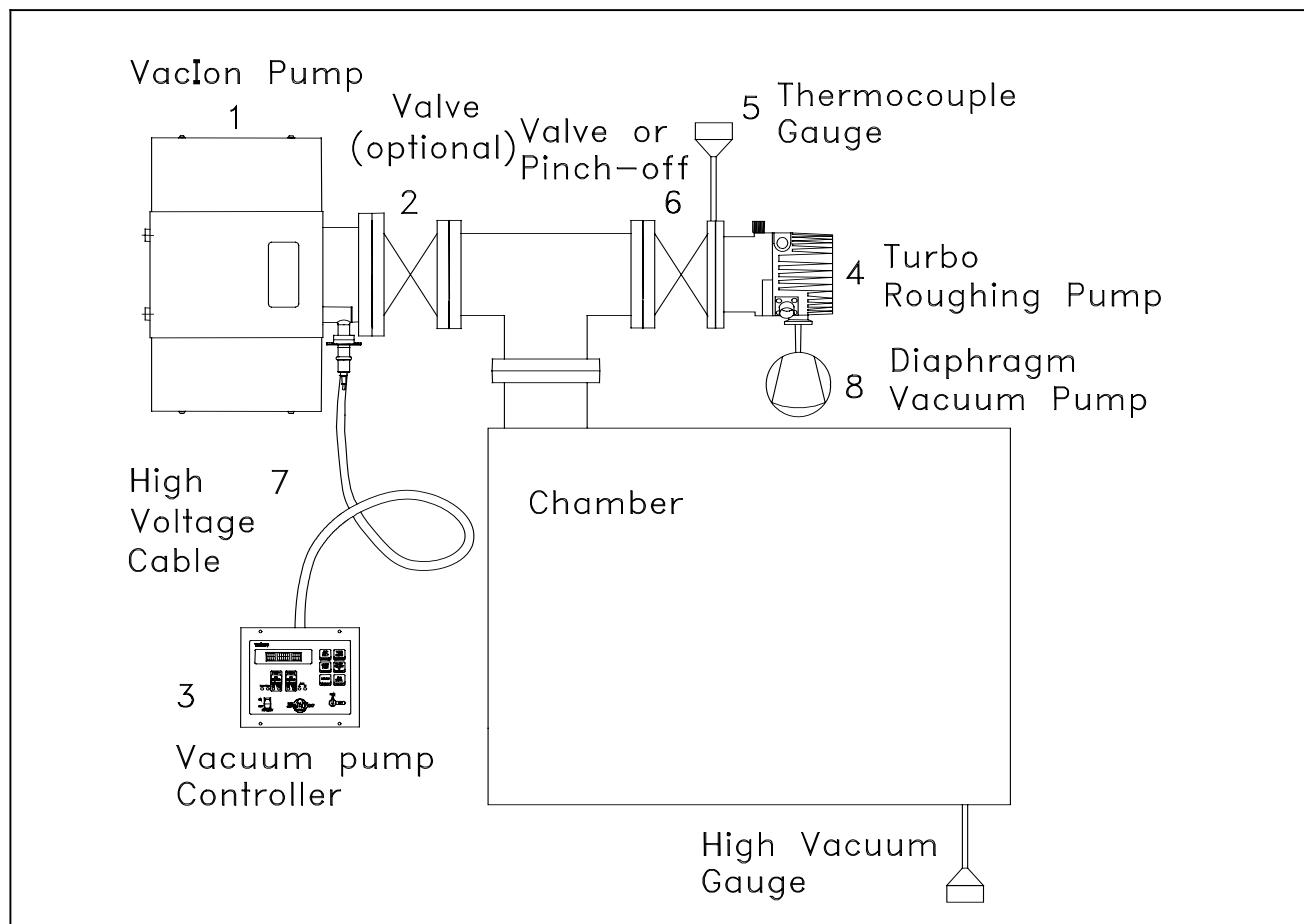


Fig. 21 - Typical installation

INLET FLANGE CONNECTION

The pump should be mounted allowing a minimum of clearance for the removal of the high voltage connector.

The pump should be kept sealed with its pinch-off tubulation until it is ready for attachment to the vacuum system. This avoids accumulation of dust and other undesirable materials. Before breaking the pinch-off seal, consult the inspection procedure (see preceding paragraph).

CAUTION

Do not open the pinch off-seal with a saw or grinder. These methods will cause metal particles to be drawn into the pump by the inrushing air as the pump is opened.

When ready to install the pump, release the internal vacuum by using pliers to open the copper tube pinch-off.

**WARNING!**

The pinch-off seal is extremely sharp. Be careful when opening. Watch your fingers.

Unscrew the main flange bolts. Remove the ConFlat flange and the copper gasket plate. Some particles of copper oxide may adhere to the outer edge of the flange gasket. Be careful not to allow them or any other foreign materials to fall into the pump.

Connect the ion pump to the vacuum chamber with a short length and large diameter tubulation in order to retain as much pumping speed as possible. Proceed as follows:

1. Inspect the mating flanges for cleanliness and absence of scratches on the knife edge.
2. Place a new copper gasket between pump flange and vacuum chamber flange.
3. Bolt mating flanges of the pump to the chamber with the screws provided with the ion pump. For flanges over NW 35 (2.75" o.d.) also mount washers below the nuts and screw heads.
4. Apply high temperature lubricant to the screw threads. Lubrication simplifies sealing and disassembly. A recommended lubricant is Fel-Pro C-100.

NOTE

Lubrication is essential to prevent galling of the nut and screw after bakeout.

5. Attach the nuts and tighten each one to 4.5 - 8 ft.-lbs (0.6 - 1.1 Kgm) of torque. After tightening a nut, always tighten the opposite nut with respect to the center of the flange. This will partially close the gap between the flange faces.
6. Repeat the sequential tightening for two more cycles.
7. Continue tightening the bolts until the flange faces meet and a pronounced increase in torque is felt.

Note that it's not possible to fix the screws from lower side, but only from upper side of the flange.

To allow a complete flexibility in the installation, a stud mounting kit is available (see Fig. 22).

For ordering information refer to the "Vacon Plus pump replacement parts and accessories" paragraph.

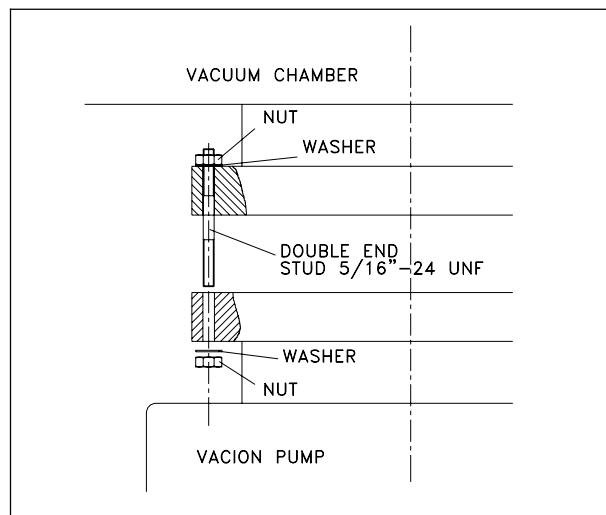


Fig. 22 - Stud mounting kit

CONTROL UNIT CONNECTION**WARNING!**

The high voltage present in the high voltage cable which connects the control unit to the ion pump, can cause severe injury or death. Before mounting the high voltage connector of the cable on the pump high voltage feedthrough, or before removing it, be sure the main power is removed from the control unit.

**WARNING!**

To avoid injury, never connect the high voltage to the pump before it is installed into the system and all the inlet flanges are properly connected or blanked off.

Connect the control unit to the ion pump with the coaxial high voltage cable assembly as follows:

1. Be sure the garter spring is properly mounted on the pump high voltage feedthrough.
2. Push the female end of the cable connector over the high voltage feedthrough.
3. Lock the connector to the feedthrough brackets with the screws mounted on the high voltage connector.
4. Push the male end of the cable connector into the socket on the control unit rear panel. (Refer to the control unit instruction manual).

**WARNING!**

Before removing the high voltage connector of the cable from the control unit, be sure the main power is removed from the control unit. Wait at least 10 seconds after removing the main power from the control unit, to allow capacitors to discharge completely.

To disconnect the coaxial high voltage cable from the controller, slide the safety locking sleeve (very little sleeve travel is required) from the control unit and at the same time pull on the male end of the cable connector to remove it from the socket on the control unit.

HEATER INSTALLATION

The heating element (Fig. 23) is composed of two plates to be fixed to the pump case.

NOTE

It is advisable to make a 10 - 15 minutes initial heating operation of the heater in a ventilated room to allow the evaporation of residual internal alloying elements.

To install the element proceed as follows (Fig. 24):

1. Remove the pole pieces;
2. Position the heating plate (1) inserting the threaded pins positioned on the pump jacket into the holes of the plate. Be sure that the written heating plate side is towards you;
3. Position the other heating plate (2) in the same way as the heating plate (1);
4. Reinstall the pole pieces;
5. Position the connection box (3) on the upper side of the pump in an oppose position of the HV feedthrough with respect to the flange, and fix it to the pump case.

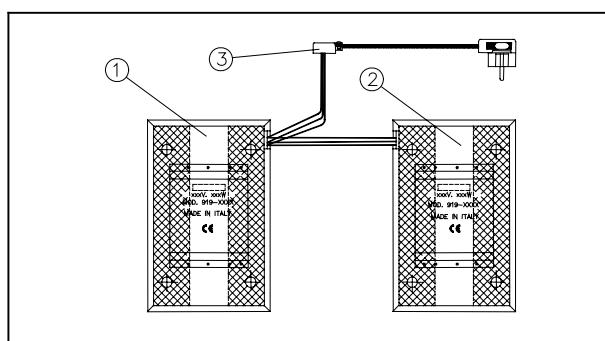


Fig. 23 - Heating element

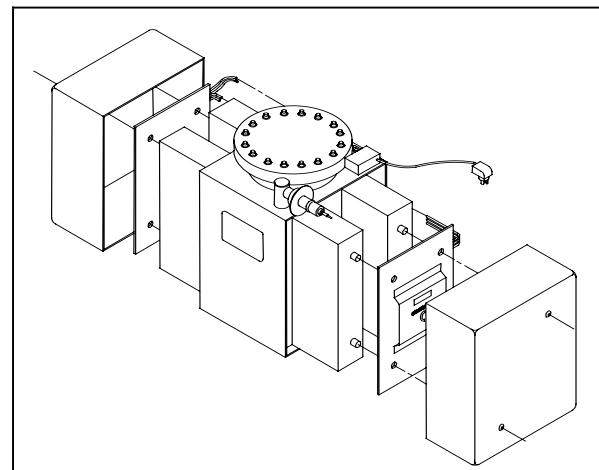


Fig. 24 - Heating element installation

BAKEOUT OPERATION

When a Vaclon pump does not reach the desired base pressure, and there are no leaks, it is necessary to bake the system. This is done by heating the pump and all the components in the system, and is generally required to achieve less than 10^{-8} Torr (mbar) base pressures.

1. Heat the pump body and the system with a bakeout oven unit or heating strips to temperatures between 150 °C and 250 °C (250 °C is the maximum allowable for most bakeable high voltage cables). This temperature is high enough to degas the pump surfaces without damaging the magnet and high voltage connector. Note that the system components must be compatible with the bakeout temperature.
2. Leave the pump control unit on and monitor the pressure. It must never increase above 6.6×10^{-5} Torr (8.7×10^{-5} mbar); if this value is exceeded, turn the bakeout off and then on again when low pressure is restored.
To control the heaters and to monitor the high pressure limit during bakeout in automatic mode, an automatically controlled relay may be used.
3. Bake the Vaclon Plus pump for at least four hours. Longer bakeout periods are recommended when the pump has been used with heavy gas loads or when UHV pressure, 10^{-9} Torr (mbar) or less is desired.
4. As the pump and system cool down to room temperature, a drop in pressure should be observed.

Note that the pump can be also baked when off, into an external turbo pump through a bakeable isolation valve.

Bakeout of Vaclon pump with the integral heaters

1. The integral heaters are to be powered with the appropriate voltage. (Please refer to the inscription on the heaters to apply correct voltage).
2. The integral heaters are designed to provide a temperature of 250 °C to 300 °C when the pump is wrapped in a 3-fold aluminum foil.

NOTE

A two-layer foil wrapping is advisable and sufficient to achieve full bakeout/regeneration if the standard European heaters (220 Vac) are operated at 240 Vac, thus preventing overheating.

3. Bakeout the Vaclon pump for 24 hours. If the pump is used in heavy gas load applications, it is recommended to bakeout the pump for a longer period.
4. Wait until the pump cools down to room temperature and recovers its initial pressure before using it in the application.



WARNING!

Do not touch the pump during the heating and cooling phases. The high temperature may cause a serious damage.

MAINTENANCE



WARNING!

The high voltage present in the high voltage cable which connects the control unit to the ion pump, can cause severe injury or death. Before mounting the high voltage connector of the cable on the pump high voltage feedthrough, or before removing it, be sure the main power is removed from the control unit.

Before removing the high voltage connector of the cable from the control unit, be sure the main power is removed from the control unit. Wait at least 10 seconds after removing the main power from the control unit, to allow capacitors to discharge completely.

Vaclon Plus pumps are maintenance free. In case of life time expiry or accidental premature failure of the pump, please contact your nearest Varian sales/service office for repair.

The Vaclon Plus 300 pumps are designed with exchangeable high-voltage feedthrough and pump elements.

Exchange of pumping element

1. Remove the internal high-voltage connections.
2. Remove the element holding brackets.
3. Pull the element out of the pocket and remove it through the inlet flange.
4. Clean the internal part of the pump with the appropriate solvent.
5. Put in the new element through the inlet flange. Make sure that the element is fixed at its rear by the two press-formed buttons of the element pocket, and at its front by the element holding clamp.
6. Reattach the high-voltage connections and test for continuity from the feedthrough.
7. Place a blank flange over the pump inlet and leak-check it with a leak detector.
8. Bake out the blanked off pump while it is operating, and leave it to cool down; then verify that the base pressure is below 10⁻⁹ Torr (mbar).

Exchange of the high voltage feedthrough.

1. Remove the 6 bolts of the Mini-ConFlat flange connection (see Fig. 25).
2. Remove the cable connection disc.
3. Gently relieve the feedthrough from the metal seal connection and turn the feedthrough counterclockwise until it is completely detached from the internal high voltage threaded connection.
4. Replace the feedthrough and the copper gasket, making sure that the feedthrough is connected to the pump's internal connector. Check that the feedthrough is not shorted.
5. Bake out the pump while it is operating, and leave it to cool down; then verify that the base pressure is below 10⁻⁹ Torr (mbar).

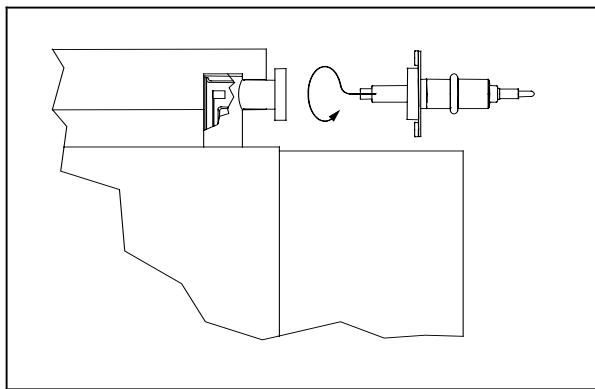


Fig. 25 - High voltage feedthrough connection

Leakage current check

If the pump current reading is to be used as pressure measurement, check the pump leakage currents as follows:

1. Turn off the pump control unit.
2. Remove the pump magnet.
3. Turn on the pump control unit and wait for current stabilization. The current reading should not be higher than $1 \mu\text{A}$. Make sure that the control unit and the high voltage cable leakage current is negligible.
4. If leakage current comes from the pump, perform the "high-potting"; then recheck the pump and install the magnet.
5. If it is not possible to "high-pot" the pump, the pressure reading is biased by the leakage current value.

Hi-potting

A constant pump current when no vacuum leak exists is often caused by field emission currents which prevent the use of the pump current as a UHV pressure indicator. To reduce this field emission current, "hi potting" should be performed. "High potting" is the term used to describe the application of higher than normal operating voltage (10-12 KV, 20-50 mA) for the purpose of burning off "whiskers" (sharp edges) on the pump cathode.

High potting should be done under vacuum and preferably without pump magnets installed (to reduce the drawn current).

The output of an appropriately sized AC transformer (i.e. neon sign type) may be applied to the pump for a period of about 30 seconds. This should effectively remove any "whiskers" or sharp edges on the pump cathode.

 **WARNING!**

Voltages developed in the High Potter power supply are potentially lethal. Use caution during operation and ensure correct grounding connection.

Heater replacement

To replace the heater element proceed as follows:

1. Disconnect the pump from the high voltage;
2. Disconnect the heater element from the main supply;
3. Disconnect the heater plates from the pump case;
4. Disconnect the heater connection box from the upper side of the pump;
5. Install the new heater element as described in the previous paragraph "HEATER INSTALLATION".

PUMP TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	CORRECTION PROCEDURE
1) - Slow starting (more than 30 minutes).	Air leaks which limit pressure to above 10^{-6} Torr (mbar) and cause longer starting time.	Leak check the vacuum system with a helium leak detector.
2) - Slow pump-down due to long exposure of viton parts to air.	Viton releases considerable gas after long exposure to air. (A bell-jar system which reached 1.5×10^{-8} Torr (2×10^{-8} mbar) in 24 hours after 30 minutes air exposure, will only reach 7.5×10^{-8} Torr (1×10^{-7} mbar) in 24 hours after 20 hours air exposure).	With the system under vacuum, pump for several days, or heat to 100-150°C for up to 15 hours.
3) - Slow pump-down due to absorption of vapours on pump and system walls.	Vapours and gases admitted to a system are absorbed on the walls of the system and pump. Subsequent reduction in pressure depends on the rate of depletion of this vapour. Heavy hydrocarbons are most troublesome because of their relative low vapour pressure and are very difficult to remove, even by baking.	Heat the system walls, thereby accelerating the desorption process. Baking mobilizes the vapours so they can be cracked and pumped by discharge.
4) - Slow starting or slow pump-down.	High voltage feedthrough is leaking.	Replace the feedthrough.
5) - Current higher than expected at any given pressure.	Ion pump leakage current causing higher pressure reading.	Highpot the pump.

VACION PLUS PUMP REPLACEMENT PARTS AND ACCESSORIES

	PART NUMBER			
	STARCELL	TRIODE	NOBLE DIODE	DIODE
Basic pump	919-0700	919-0872	919-0701	919-0702
Pump with options				
With heaters installed (120 V) (220 V)	919-0711 919-0712	919-0873 919-0874	919-0731 919-0732	919-0741 919-0742
Double-ended	919-0713	919-0875	919-0733	919-0743
Double-ended with heaters installed (120 V) (220 V)	919-0716 919-0717	919-0876 919-0877	919-0736 919-0737	919-0746 919-0747
Cables and accessories				
HV Bakeable cable, 13' (4 m) long			929-0710	
Replacement parts				
HV Feedthrough			959-5120	
Pumping elements (q.ty 2 needed)	919-9030	919-9035	919-9045	919-9040
Heaters (power: 580 W) (120V) (220V)			919-0075 919-0074	
Garter spring			00.601410-01	
Copper gasket for 8" inlet flange (10-pack, individually sealed)			FG-0800-CI	
Nut and bolt set for 8" inlet flange			FB-0600-C12	
Copper gasket for 1 1/3" CF feedthrough flange (10-pack, individually sealed)			FG-0133-CI	
Nut and bolt set for 1 1/3" CF feedthrough flange, 8-32x3/4 (25-pack)			FB-0133-C	

For a complete overview of Varian's extensive vacuum product line, please refer to the Varian Vacuum Catalogue.

VACION PLUS PUMP CONTROLLERS

The following controller series are available to supply the Vaclon Plus pumps:

- MiniVac
- MidiVac
- Dual

Please refer to the Varian Vacuum Catalogue to choose the correct controller for each pump.